

**Supporting Information for**

**Assessing Affective Differences Between A Virtual General  
Chemistry Experiment and a Similar Hands-On Experiment**

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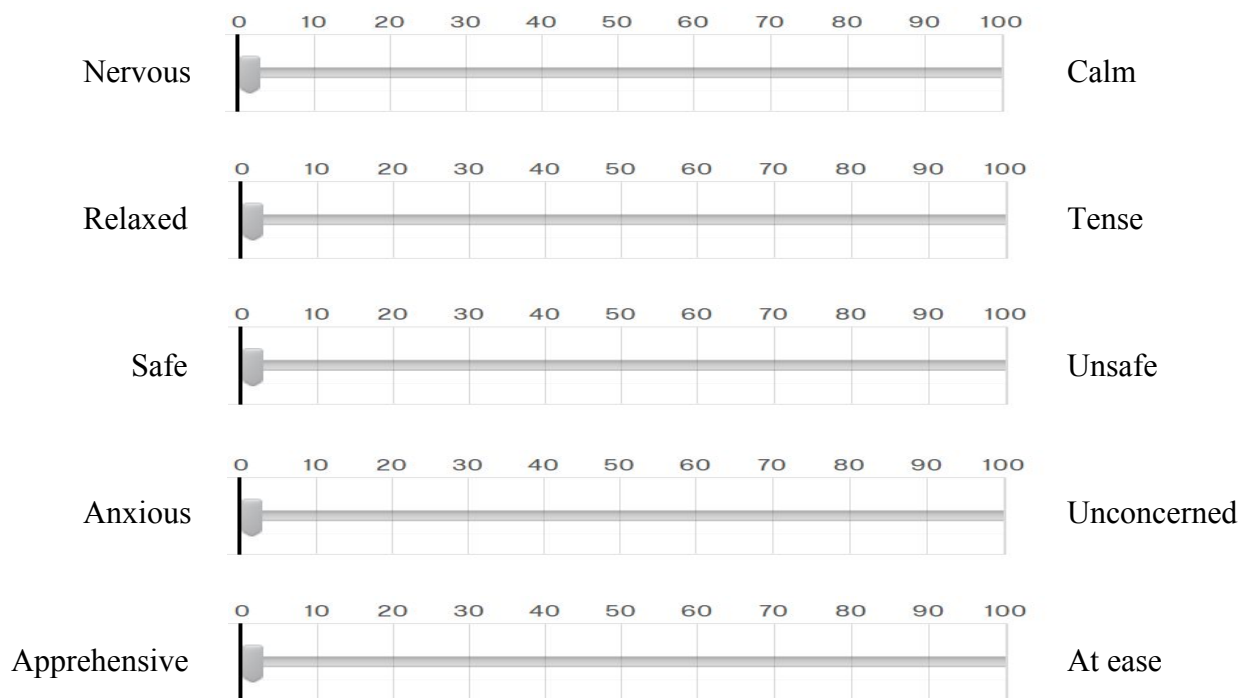
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**Survey items as administered**

**For the following items present word pairs related to the laboratory experiment you just completed. Please use the slider bar to indicate your response for each.**

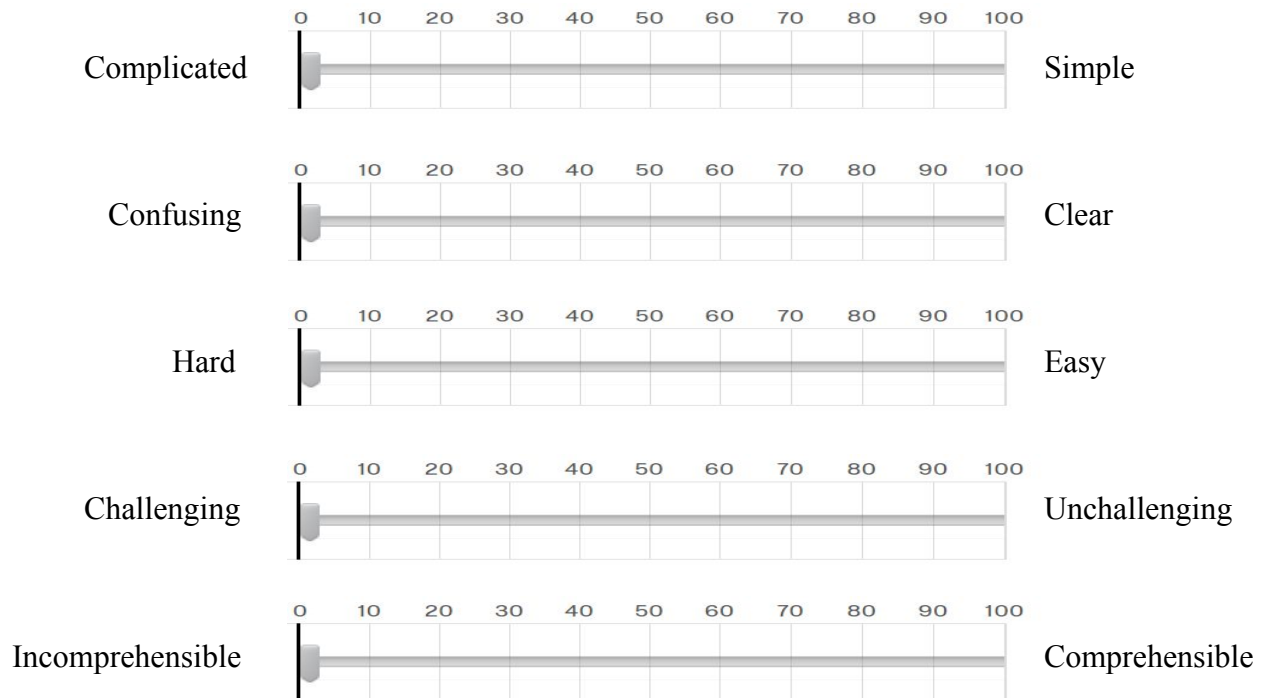
**Anxiety**

**During this experiment I felt:**



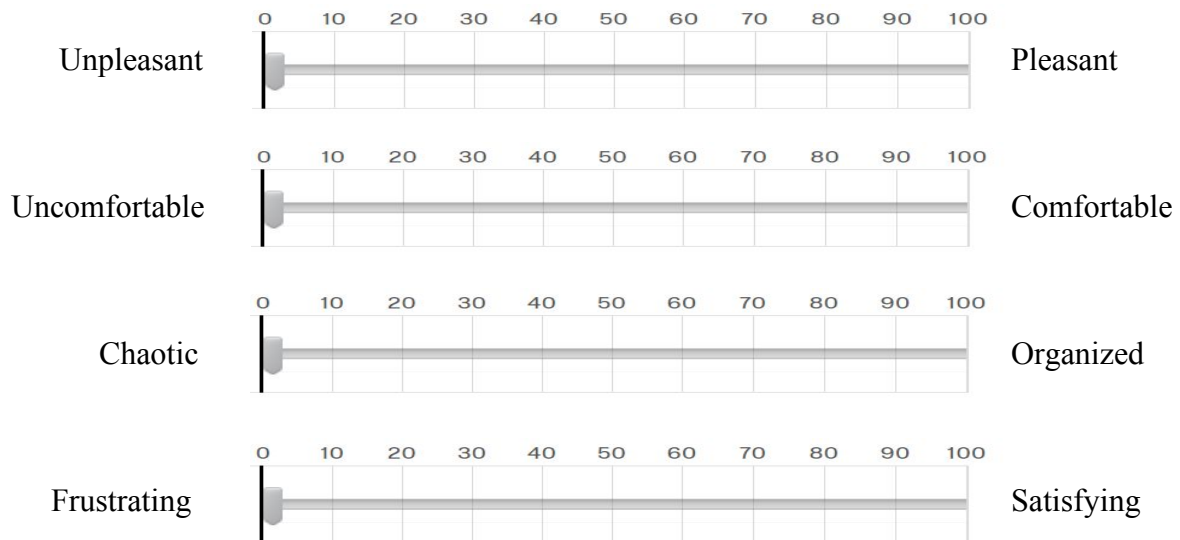
## Intellectual Accessibility

**This experiment was:**



## Emotional Satisfaction

**This experiment was:**



**For the following items, please indicate the level to which you agree with the statement.**

**Initial Interest-Feeling**

I am fascinated by chemistry

- a) Strongly agree
- b) Somewhat agree
- c) Neither agree nor disagree
- d) Somewhat disagree
- e) Strongly disagree

I chose to take general chemistry because I'm really interested in the topic

- a) Strongly agree
- b) Somewhat agree
- c) Neither agree nor disagree
- d) Somewhat disagree
- e) Strongly disagree

I am really excited about taking this class

- a) Strongly agree
- b) Somewhat agree
- c) Neither agree nor disagree
- d) Somewhat disagree
- e) Strongly disagree

I am really looking forward to learning more about chemistry

- a) Strongly agree
- b) Somewhat agree
- c) Neither agree nor disagree
- d) Somewhat disagree
- e) Strongly disagree

### **Initial Interest-Value**

I think the field of chemistry is an important discipline

- a) Strongly agree
- b) Somewhat agree
- c) Neither agree nor disagree
- d) Somewhat disagree
- e) Strongly disagree

I think that what we will study in General Chemistry will be important for me to know

- a) Strongly agree
- b) Somewhat agree
- c) Neither agree nor disagree
- d) Somewhat disagree
- e) Strongly disagree

I think what we will study in General Chemistry will be worthwhile for me to know

- a) Strongly agree
- b) Somewhat agree
- c) Neither agree nor disagree
- d) Somewhat disagree
- e) Strongly disagree

### **Usefulness of Lab**

This experiment allowed me to study complex problems

- a) Strongly agree
- b) Somewhat agree
- c) Neither agree nor disagree
- d) Somewhat disagree
- e) Strongly disagree

I liked performing this experiment

- a) Strongly agree
- b) Somewhat agree
- c) Neither agree nor disagree
- d) Somewhat disagree
- e) Strongly disagree

This experiment was interesting to me

- a) Strongly agree
- b) Somewhat agree
- c) Neither agree nor disagree
- d) Somewhat disagree
- e) Strongly disagree
- f)

I learned from the experiment

- a) Strongly agree
- b) Somewhat agree
- c) Neither agree nor disagree
- d) Somewhat disagree
- e) Strongly disagree

### **Equipment Usability**

This experiment was easy to set-up and operate

- a) Strongly agree
- b) Somewhat agree
- c) Neither agree nor disagree
- d) Somewhat disagree
- e) Strongly disagree

This experiment worked well

- a) Strongly agree
- b) Somewhat agree
- c) Neither agree nor disagree
- d) Somewhat disagree
- e) Strongly disagree

### **Open-Endedness of Lab**

It was easy to explore in this experiment

- a) Strongly agree
- b) Somewhat agree
- c) Neither agree nor disagree
- d) Somewhat disagree
- e) Strongly disagree

This experiment was too long

- a) Strongly agree
- b) Somewhat agree
- c) Neither agree nor disagree
- d) Somewhat disagree
- e) Strongly disagree

**Table SI1:** Initial MANOVA results.

	<b>Type III Sum of Squares</b>	<b>F</b>	<b>Sig.</b>	<b>Partial Eta Squared</b>
<i>initial interest-feeling</i>	0.460	0.532	0.466	0.001
<i>initial interest-value</i>	0.794	1.397	0.238	0.004
<i>anxiety</i>	847.545	1.401	0.237	0.004
<i>intellectual accessibility</i>	6636.629	10.666	0.001	0.027
<i>emotional satisfaction</i>	13751.823	19.931	0.000	0.049
<i>usefulness of lab</i>	9.158	11.239	0.001	0.028
<i>equipment usability</i>	20.577	22.870	0.000	0.056
<i>open-endedness of lab</i>	0.001	0.001	0.971	0.000

**Table SI2:** Average Scale Score by Teaching Assistant.

<b>TA</b>	<b>Anx</b>	<b>ES</b>	<b>IA</b>	<b>II-F</b>	<b>II-V</b>	<b>UoL</b>	<b>EU</b>	<b>OeoL</b>
1	37.32	72.08	61.49	3.81	4.24	3.75	4.15	3.60
2	35.98	64.52	58.00	3.91	4.38	3.92	4.19	3.52
3	32.56	70.04	62.69	3.65	4.21	3.71	4.07	3.32
4	27.05	75.62	68.71	3.62	4.38	3.71	4.19	3.46
5	32.14	77.99	73.04	3.97	4.40	3.89	4.31	3.54
6	32.20	73.12	72.98	3.67	4.29	3.72	4.38	3.81
7	26.89	70.33	66.54	3.97	4.30	4.34	4.48	4.11
8	30.81	65.11	63.83	3.62	4.21	3.06	3.68	3.52
9	32.63	65.26	57.05	3.79	4.21	3.59	4.04	3.72
10	39.30	64.41	56.78	3.66	4.19	3.76	3.76	3.24
11	40.30	56.79	55.92	3.79	4.27	3.41	3.65	3.23
12	37.55	56.14	57.95	3.58	4.26	3.47	3.80	3.62
13	41.28	49.71	52.96	3.79	4.41	3.09	3.26	3.30
14	36.73	56.15	53.51	3.45	4.02	3.16	3.39	3.48

Anx: anxiety, ES: emotional satisfaction, IA: intellectual accessibility, II-F: initial interest-feeling,  
 II-V: initial interest-value, U: usefulness of lab, EU: equipment usability, OE: open-endedness of lab

Note: Data from TAs 1-6 were grouped as 'Hands-On', data from TAs 7-10 were grouped together as 'Virtual Group A', and data from TAs 11-14 were grouped together as 'Virtual Group B'